ARS 42-137
October 1967

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service

A SEED HOPPER FOR LIGHT FLUFFY GRASS SEED

By Charles W. Gantt 1/

A seed hopper needed to make experimental plantings of light fluffy grass seed was developed by adding short conveying chains across the top of a revolving-cylinder, top-delivery hopper originally developed for distributing commercial fertilizer. Both the cylinder and the plunger supporting the seed revolve. The plunger is threaded to a central screw which remains stationary. The pitch of the thread is such that as the cylinder revolves, the plunger is elevated a distance of 1 inch for every five turns of the cylinder. The basic revolving-cylinder, top-delivery hopper used in this development has been available for research use in limited quantities, on special order from the Cole Manufacturing Co., Charlotte, N.C. 2/

Bottom-delivery type hoppers for light fluffy grass seed cause problems in bridging of the seed. These hoppers depend on gravity for seed flow and the weight of the seed is not great enough to carry them to the bottom as the hopper empties. After the hopper operates a short time, the seed stop flowing because a cavity develops around the seed agitator.

In the hopper described herein, bridging of the seed is impossible because the bottom moves up during the emptying process and the seed is conveyed off the top of the hopper by conveyor chains. Metering of seed is positive as the seed are lifted and then conveyed to the outlet tubes by mechanical force.

How the Hopper Operates

Conveyor chains with short tines were added at the top of a top-delivery fertilizer hopper (fig. 1). Two conveyor chains were installed to the two outlets. One conveyor chain is driven by a V-belt from a pulley on the hopper drive shaft. The other conveyor chain is driven by a pair of gears that mesh into each other from the first chain but in the opposite direction. The seed is conveyed from the center of the hopper outward and is pushed over the edge of the hopper into delivery tubes.

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2/ Trade name is used in this publication solely to provide specific information. Mention of the trade name does not constitute a guarantee or warranty by the U.S. Department of Agriculture and does not signify that the product is approved to the exclusion of other comparable products.

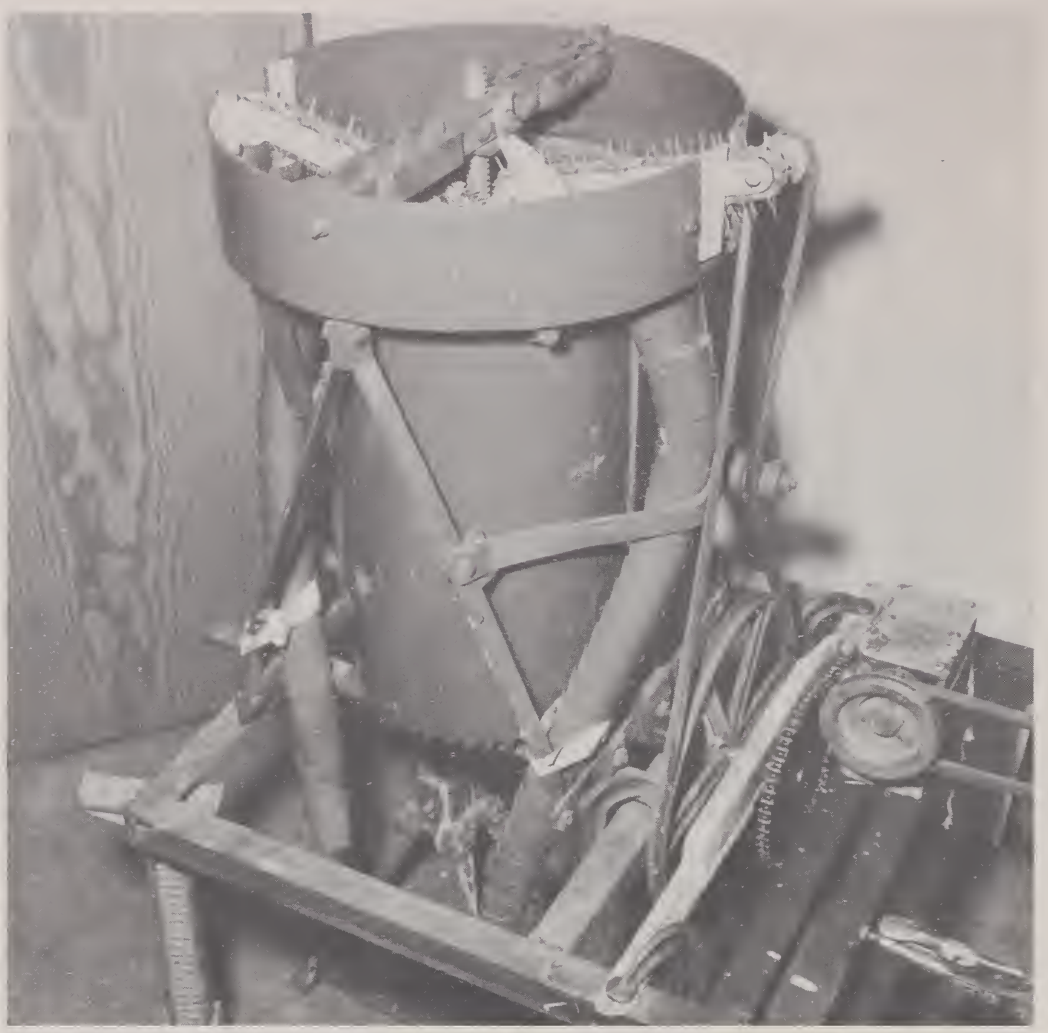

Figure 1. Pair of conveyor chains as installed in the top of a revolving-cylinder, top-delivery hopper.

Rate of seed per acre is controlled by the speed the cylinder rotates in relation to the speed of travel of the seed drill. By varying the sprocket drive ratio, various rates can be obtained. The conveyor chains are made of No. 25 or No. 35 roller chain with tines soldered on alternate sides to every third link. The tines are made from short lengths of stiff wire (1/8 inch in diameter by 3/4 inch long) similar to brass brazing rod. The two steel gears that connect the conveyor chains in the center of the hopper are each about 1 inch in diameter.

A 1/2-inch-width V-belt is used to drive the conveyor chains, with a 10-inch-diameter pulley on the hopper drive shaft and a 1 1/2-inch-diameter pulley on the conveyor chain shaft. The V-belt is operated at a 90° turn as the hopper drive shaft and the conveyor chain drive shaft are at right angles to each other.

Output of the Hopper

The rate-per-acre output increases slightly as the contents of the hopper progresses from full to empty. This is due to compression of the seed as the hopper bottom moves upward during operation. Some output values for each 10-minutes of seed delivery of light fluffy grass seed are given below. The hopper was full at the beginning of the test and nearly empty at the end.

Right side	Left side
Grams	Grams
17.0	16.6
18.5	13.5
18.6	16.2
16.7	17.1
14.7	18.7
21.3	18.2
19.3	16.9
19.1	19.4
21.1	18.0
24.3	12.5

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Beltsville, Maryland 20705

Postage and Fees Paid
U. S. Department of Agriculture

Official Business

ARS 42-141
November 1967

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Agricultural Research Service

SEPARATE SEED PLACEMENT ATTACHMENT FOR FERTILIZER GRAIN DRILLS

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For years fertilizer grain drills have either placed the fertilizer in contact with the seed or in a separate band above the seed row. Numerous field tests, however, have shown that close-drilled crops emerge faster with better initial stands when the fertilizer is placed in a separate band below seed level. Since about 1958, grain drills with openers that place seed and fertilizer separately have become available from farm machinery manufacturers. Many of these openers, however, place the seed at the same depth as the fertilizer and separation is obtained by using different lateral positions of the two materials.

This report describes a device designed to provide separate placement of seed and fertilizer, positioning each at a different depth in the soil. Usually, the fertilizer is placed deeper than the seed.

The device is an attachment for a double-disk opener of standard design. It consists of a curved plate or "toe shield" that is attached to one side of the opener to form a depositor for the seed (fig. 1). This toe-shield attachment is mounted on the outside of the front half of the disk. It is adjustable in the vertical position from 1 to 3 inches above the bottom of the double disks. A metal tube extends upward from the toe-shield attachment, and the delivery hose from the seedbox is inserted into the tube. The hose from the fertilizer spout is inserted in the usual opening provided between the two disk blades of the double-disk opener.

The toe-shield attachment is made from the toe piece of the boot of a single-disk opener that has been slightly reshaped to fit the flat side of the straight disk. The other pieces of the attachment are made from standard sizes of steel and pipe stock.

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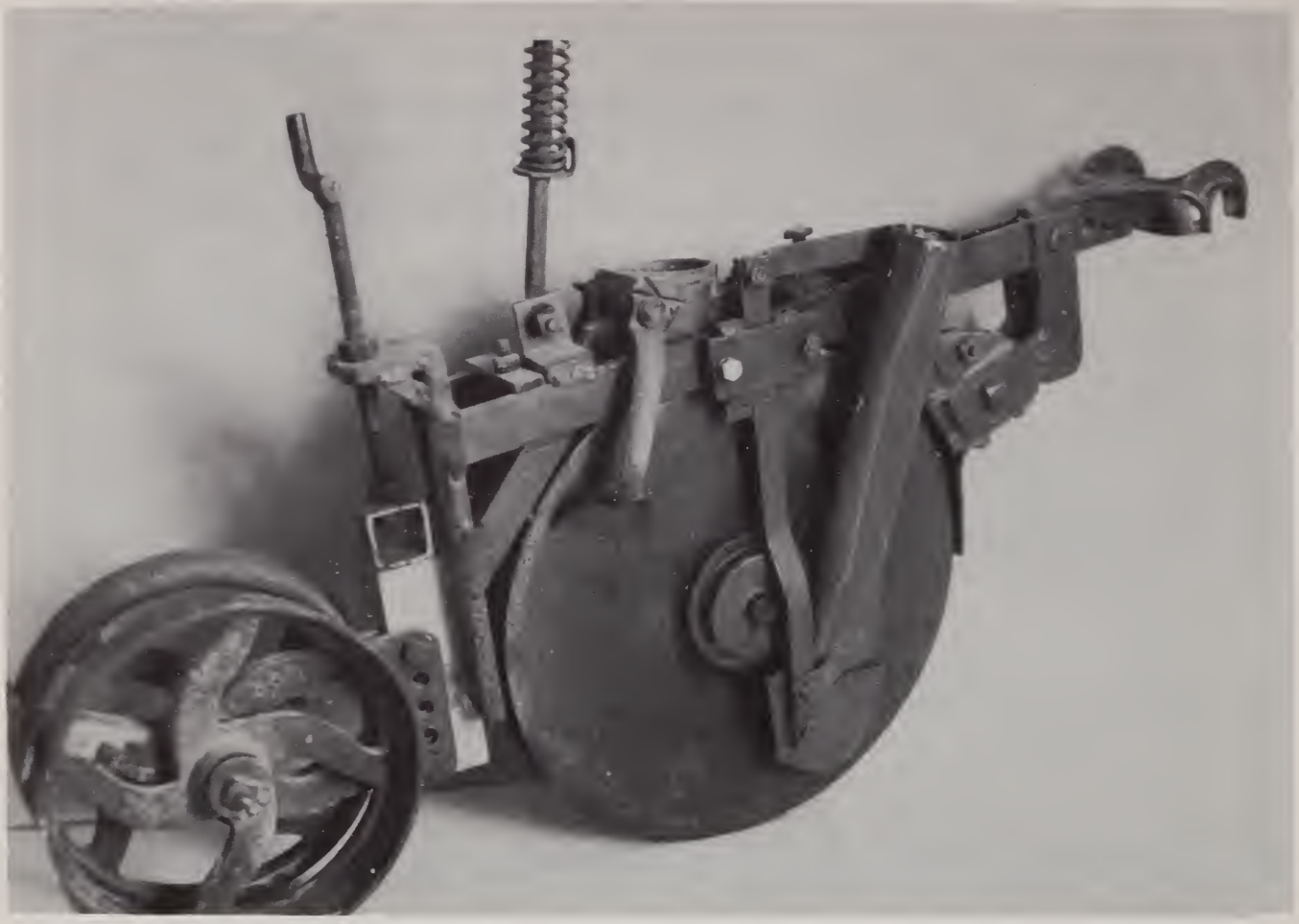

Figure 1. - A double-disk opener with "toe-shield" attachment mounted against the front portion of one disk to provide separation of seed and fertilizer in the soil.

This placement device has been used with certain crops in several Southeastern States on different soil types and has performed satisfactorily.

At Beltsville, Md., slow-motion moving pictures (128 frames per second) were made of performance tests where the toe shield was used in a friable soil with good moisture. They show considerable turbulence of seed in the soil before most of the seed settles in an area above the fertilizer band. Depth of the seed is quite varied; consequently, the toe-shield unit may be suitable for such seeds as small grains, whose emergence is not sensitive to seeding depth. Firming wheels of the commonly used downward-pressure type would probably be ineffective and impractical for use with this device. However, a press wheel in a narrow wedge shape (such as a V-shape) that would press the seed in an outward and downward direction might be effectively used with this opener.

Experiments were conducted at Blairsville, Ga., in 1961 and 1962 to compare the toe-shield attachment with the separate opener and contact method. Tables 1 and 2 show the effect of fertilizer position on seedling emergence and yield of Starr millet. A 9-27-27 fertilizer was applied at 300 pounds per acre and millet was seeded at 20 pounds per acre. Double- press wheels followed the double-disk openers to gage the depth of seed and fertilizer and to firm the soil.

Table 1.- The effect of seed and fertilizer placement on stand and yield of Starr millet on a Hayesville clay loam soil (upland) in 1961 1/

Fertilizer position with respect to seed	Estimated stand at 1 month	Yield of dry matter at 2 months, 1st clipping	Total yield of dry matter
	Percent	Tons per acre	Tons per acre
1 inch below and 1 inch to side	88	1.48	2.45
1 inch below (toe shield)	81	1.46	2.46
1 inch below (two separate openers)	89	1.26	2.22
Contact	70	1.27	2.45
Least significant difference at 5 pct level	15	N.S. 2/	N.S. 2/

1/ Partial list of treatments.
2/ Not Significant.

Table 2.- The effect of seed and fertilizer placement on stand and yield of Starr millet on a Tusquittee loam soil (bottomland) in 1962 1/

Fertilizer position with respect to seed	Stand 20 days after planting	Yield of dry matter at 5 weeks, 1st clipping	Total yield of dry matter
	Per square foot	Tons per acre	Tons per acre
1 inch below and 1 inch to side	12	1.36	2.84
1 inch below (toe shield)	19	1.78	3.09
1 inch below (two separate openers)	11	1.40	2.60
Contact	8	1.09	2.00
Least significant difference at 5 pct level	4	N.S. 2/	N.S. 2/

1/ Partial list of treatments.
2/ Not Significant.

SUMMARY

The toe-shield attachment is a simple device, suitable for mounting on double-disk opener-equipped drills, that will provide vertical separation of seed and fertilizer in the soil. By using this new design, manufacturers can offer farmers a means of applying seed and fertilizer with definite separation through a single-opener unit at a cost only slightly above that of drills presently available.